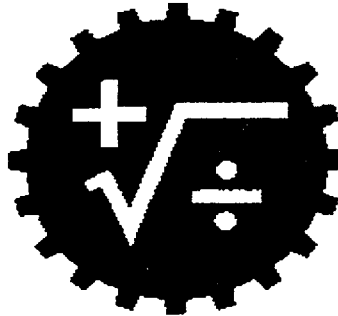


**Assessment Annotations  
for the Curriculum Frameworks**

# **Mathematics**

**Grades 4, 8, and 10**



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Missouri Department of Elementary and Secondary Education  
Robert E. Bartman, Commissioner of Education

# **MATHEMATICS- ASSESSMENT ANNOTATIONS**

## **For The**

### **Mathematics Curriculum Frameworks**

The attached document provides supplemental assessment information to *Missouri's Framework for Curriculum Development in Mathematics K-12*. Contained within this assessment supplement are annotations that should be useful in understanding state and local responsibilities in assessing curriculum at the fourth, eighth, and tenth grade levels. This document indicates appropriate content and process specifications that should be useful in establishing curricula that prepares students to be proficient in mathematics.

Since the fourth and eighth grade benchmarks were established by the Framework's design, the column labeled, "What Students Should Know," establishes content that is appropriate for state testing. In addition, at the fourth, and eighth grade, the column labeled "What Students Should Be Able To Do" indicates appropriate processes for assessment. The last column labeled "Assessment Notes" further clarifies whether these processes are best assessed at the state or local level. If the phrase "Grade ( 4 or 8) state assessment" is shown then this indicates that this process may be tested on the state mathematics examination at the indicated grade level.

Because benchmarks were not explicitly indicated at the tenth grade, the assessment notes provide information for both the "To Know" and "To Do" columns. The assessment notes indicate whether the content and processes are appropriate for assessment at the tenth grade on the state examination. Under the "Know" and "Do" categories in the assessment notes column, if the notation "Grade 10 state assessment" is indicated then this identifies content and processes that may be assessed at the state level. Under the "Do" of the assessment notes, process items are classified on whether these are assessed at the state level or better assessed at the local level. The notation "Beyond 10<sup>th</sup> grade state assessment" indicates material that students may or may not have covered at this point and therefore is not tested at the state level.

All of the benchmarks that were identified by the notation, "Grade (4, 8, or 10) state assessment," will not necessarily appear on a state test in any given year. The number of test items developed to access mathematical content and processes may vary from year-to-year. Only Framework pages that required assessment notes are provided within this document which results in the skipping of some page numbers.

# VIII. Patterns and Relationships

## What All Students Should Know

*By the end of grade 4, all students should know*

1. Mathematical ideas may be represented with visual models.
2. Mathematical symbols can be used to represent real-world situations.
3. Patterns and relationships can be represented in a variety of ways.
4. Information can be organized to look for a pattern or relationship.
5. Patterns can be geometric and/or numeric.

## What All Students Should Be Able To Do

NOTE: Each item in this column is designed to address several elements of "what all students should be able to do."

*By the end of grade 4, all students should be able to*

- a. create, recognize, describe, and extend a wide variety of patterns (NCTM Standard 13; MO 1.6, 1.8, 2.1, 3.3)
- b. represent and describe mathematical **relationships** (NCTM Standard 13; MO 1.6, 1.8, 2.2, 3.3)
- c. investigate the use of variables and open sentences in expressing relationships (NCTM Standard 13; MO 1.6, 1.8, 3.3)

## Fourth Grade Assessment Notes

Do

- a. Grade 4 state assessment
- b. Grade 4 state assessment
- c. Grade 4 state assessment

What All Students Should Know

What All Students Should Be Able To Do

Eighth Grade Assessment Notes

*By the end of grade 8, all students should know*

1. Mathematical ideas may be represented with visual models.
2. Mathematical symbols can be used to represent **real-world** situations.
3. Patterns and relationships can be represented in a variety of ways.
4. Information can be organized to look for a pattern or relationship.
5. Patterns can be geometric and/or numeric.

NOTE: Each item in this column is designed to address several elements of "what all students should be able to do."

*By the end of grade 8, all students should be able to*

- a. examine, predict, design, extend, and describe patterns and relationships (NCTM Standard 8; MO 1.6, 1.8, 2.1, 3.3)
- b. design and compare patterns and relationships using rules, charts, and graphs that may be constructed using technology (NCTM Standard 8; MO 1.6, 1.8, 2.7, 3.3)
- c. examine patterns, relations, and functions to determine how a change in the independent variable can produce a change in a dependent variable (NCTM Standard 8; MO 1.6, 1.8, 3.3, 3.6)
- d. apply patterns, relations, and functions to solving real-world problems (NCTM Standard 8; MO 1.6, 1.8, 3.3, 3.6)
- e. solve equations and inequalities (NCTM Standard 9; MO 1.6, 1.8, 2.2, 3.3)

Do

- a. Grade 8 state assessment
- b. Grade 8 state assessment
- c. Grade 8 state assessment
- d. Grade 8 state assessment
- e. Grade 8 state assessment

What All Students Should Know	What All Students Should Be Able To Do	Tenth Grade Assessment Notes	
<p><i>By the end of grade 12, all students should know</i></p> <ol style="list-style-type: none"> <li>1. Mathematical patterns and relationships may be represented in various forms.</li> <li>2. Mathematical symbols can be used to represent real-world situations.</li> <li>3. Definitions of sequences and series.</li> <li>4. Trigonometric ratios of sine, cosine, and tangent.</li> <li>5. Subsets of the real number system.</li> </ol>	<p>NOTE: Each item in this column is designed to address several elements of "what all students should be able to do."</p> <p><i>By the end of grade 12, all students should be able to</i></p> <ol style="list-style-type: none"> <li>a. compare and contrast the real number system and its various subsystems with regard to their structural characteristics (NCTM Standard 14; MO 1.6, 1.8)</li> <li>b. represent and analyze relationships using verbal rules, tables and graphs as tools to interpret expressions, equations and inequalities (NCTM Standards 5 and 6; MO 1.6, 1.8, 2.1, 3.3)</li> <li>c. translate among tabular, symbolic, and graphical representations of functions and model real-world phenomena with a variety of functions (NCTM Standard 6; MO 1.6, 1.8, 2.2, 3.6)</li> <li>d. represent situations that involve variable quantities with expressions, equations and inequalities (NCTM Standard 5; MO 1.6, 1.8, 3.3)</li> </ol>	<p>Know</p> <ol style="list-style-type: none"> <li>1. Grade 10 state assessment</li> <li>2. Grade 10 state assessment</li> <li>3. Beyond 10" grade state assessment</li> <li>4. Beyond 10" grade state assessment</li> <li>5. Grade 10 state assessment</li> </ol>	<p>Do</p> <ol style="list-style-type: none"> <li>a. Grade 10 state assessment</li> <li>b. Grade 10 state assessment</li> <li>c. Grade 10 state assessment</li> <li>d. Grade 10 state assessment</li> </ol>

# VIII. Patterns and Relationships

## What All Students Should Know

## What All Students Should Be Able To Do

## Tenth Grade Assessment Notes

- e. solve equations and inequalities (NCTM Standard 5; MO 1.6, 1.8, 2.2, 3.3)
- f. translate **between** synthetic and coordinate representation for geometric relationships (NCTM Standard 8; MO 1.6, 1.8, 2.2, 3.3)
- g. investigate limiting processes by examining infinite sequences and series (NCTM Standard 13; MO 1.6, 1.8, 3.3)
- h. apply trigonometry to problem situations involving triangles and explore real-world phenomena using the sine, cosine, and tangent functions (NCTM Standard 9; MO 1.6, 1.8, 2.2, 3.6)
- i. analyze effects of parameter changes on the graphs of functions using a variety of technologies to gather data (NCTM Standard 6; MO 1.4, 1.6, 2.7, 3.3)

Do

- e. Grade 10 state assessment
- f. Beyond 10<sup>th</sup> grade state assessment
- g. Beyond 10<sup>th</sup> grade state assessment
- h. Beyond 10<sup>th</sup> grade state assessment
- i. Grade 10 state assessment